

SECTION 16940

PUMP STATION CONTROL PANEL

PART 1. GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish and install a pump station control panel, which shall include the level controller, relays, switches, lamps, and all electrical material specified herein or required for a complete installation.
- B. The contractor is responsible for the erection, installation and start-up of the equipment covered under these specifications.

1.02 RELATED SECTION

- A. Section 16051 - Pump Station Electrical Materials.

1.03 QUALITY ASSURANCE

- A. All electrical materials and equipment shall be new, of recent domestic manufacture, and approved by the Underwriters' Laboratories, Inc. Material or equipment damaged in the course of installation or test shall be replaced or repaired in a manner meeting with the approval of the Department. Further, said repairs or replacement shall be performed by personnel qualified such that the UL approval will not be lost. The Contractor shall provide satisfactory evidence of these qualifications to the MD-WASD prior to the work being performed.
- B. All electrical material and installation shall comply with the following codes and standards listed in Section 16051, Subsection 1.03.
- C. Furnish equipment designed, built and tested by a firm with at least ten years of experience manufacturing this type of equipment.
- D. Comply with NFPA 70, "National Electrical Code," for components and installation.
- E. Furnish equipment that bear the UL label.

1.04 SUBMITTALS

- A. The Contractor shall provide all submittals in accordance with Section 16051, Subsection 1.04
- B. Submit for review, properly identified manufacturers' literature and shop drawings including but not limited to the following:
 - 1. Dimensioned outlined drawings (Plan and Elevations).
 - 2. Itemized bill of materials.
 - 3. Manufacturers' literature and shop drawings for every piece of equipment mounted on the panel.

4. Enclosure construction details.
5. Operating and maintenance manuals.
6. Detailed external wiring diagram and sequence of operation.

PART 2. PRODUCTS

2.01 GENERAL

- A. The Control Panel shall be designed and built as integrated, pre-wired equipment. It shall control the operation of number of pumps in the station, based on the level in the wet well.
 1. Level controller (specified in Section 16051, Subsection 2.19) shall monitor the wet well level and actuate the sewage pumps in sequence with rising water level. Once a pumping cycle has started, it shall continue until the stop level is reached. All start/stop levels shall be adjustable, based on design levels shown on the Plans. Controller shall maintain level to within $\pm 1\%$ of full scale (i.e. maximum depth).
 2. The level controller shall have a 3-position selector switch for manual selection of pumps sequence. An alarm shall be annunciated whenever the lag pump is called on, indicating failure of lead pump.
 3. The Panel shall include the level indicator and pumps alternators, motor controllers, relays, switches, lamps, pressure switches and any other device shown on the Plans, or required to function as specified. Shop drawings of every device shall be submitted and approved before the panel is assembled.
 4. Phase monitor relay shall be Timemark Model 258, Potter-Brunfield CPS-38, or approved equal, fused on line side and disconnect only for 3-phase equipment.
 5. Selector switch to manually select or automatically alternate position of "lead" and "lag", sewage pumps after each pumping cycle shall be furnished and installed.
 6. The manufacturer of the control system shall be certified by the Underwriters Laboratories (UL) as a UL 698A listed system panel manufacturer certified to install serialized label for quality control and insurance liability considerations.
- B. Each major component shall be identified by an engraved phenolic nameplate.
- C. All wiring shall be a flexible, stranded type and each conductor shall be tagged and numbered according to wiring diagrams and neatly tied.
- D. The Control Panel shall be dimensioned to facilitate maintenance.

2.02 ALARMS

- A. Control panels shall be capable of reporting, a minimum, of the following alarm points:
 1. Dry Well High Level (Float switch).
 2. Wet Well High Level.
 3. Wet Well Low Level (With auxiliary contact to stop sewage pumps.)

4. Level Controller Failure.
5. Sewage Pump High Temperature or Failure (with pump shut down, lock out relay and reset push button.)
6. Loss of Phase Voltage.
7. Sump Flood (Dry well only).

B. Provide three spare alarm points and one set of N.O./N.C. contacts from common alarm relay for remote signaling. Every alarm shall be indicated by a labeled red pilot light mounted in the control panel. A red light with guard protector, as Series VDA manufactured by Crouse-Hinds, or approved equal and a bell with silencing buttons shall be mounted in the service enclosure. The alarm lights shall remain "on" until alarm signal is reset at control panel.

2.03 MOTOR STARTERS

- A. Motor starters shall be sized as indicated on the drawings, with overloads to match the supplied motors. One set of N.O./N.C. spare contacts shall be provided in the sewage pump starter. Motor starters to be Siemens, Square D, Cutler Hammer, or approved equal.
- B. Starters for sewage pumps shall be three-phase, sized in accordance with the following table:

NEMA SIZE STARTER			
Motor Size (Horsepower)	Single Phase 240 Volt	Three Phase 208 Volt	Three Phase 480 Volt
Up to 5	2	1	1
7½	2	2	1
10	-	2	2
15	-	3	2
20	-	-	2
25	-	-	3
30	-	-	3
40	-	-	3
50 to 75	-	-	4
100 to 150	-	-	5

2.04 CONTROL PANEL ACCESSORIES

- A. All wiring shall be a flexible, stranded type and each conductor shall be tagged and numbered according to wiring diagrams and neatly tied.

- B. All external wiring shall terminate in a terminal block, Square D Type G class 9080, or equal.
- C. Relays shall be socket-mounted for ease of replacement, Square D Type K Class 8501, or equal.
- D. Lamps, push bottoms, and switches shall be heavy duty oil-tight/watertight, Square D, Type K Class 9001, or equal.
- E. Elapsed time meters shall be provided to indicate total running time of each sewage pump in "hours" and "tenths of hours". Meters shall be Eagle Signal Series HK or approved equal. An extra elapse time meter shall be furnished and installed to indicate the total time for all pumps simultaneous run.

2.05 LEVEL CONTROLLER

- A. As specified in Specification Section 16051.

2.06 TELEMETRY

- A. Telemetry (RTU) provided by the M-DWASD shall be installed by the Contractor in its own weather-proof and corrosion-resistant enclosure separate from the control panel enclosure. The manufacturer of the control system shall provide the hardware required to interface the controller with the M-DWASD SCADA System to remotely start-stop the pumps and monitor the operation of pumps and alarms.

2.07 CONSTRUCTION

- A. Outside panels shall be gasketed, NEMA 3R, free standing, stainless steel, 12 gauge minimum construction, with same material continuous hinges and dead front anodized aluminum inner door. Finishing of the enclosure to be No. 2B. Padlocking of motor circuit breakers shall not obstruct the closing of the inner doors.
- B. Inside panels shall be NEMA 12, constructed of .080 inches thick anodized aluminum or 14 gauge 316 stainless steel. Control wiring shall be color coded (minimum of 16 different colors), 16 gauge, 600 volts, 90 degree C. standard tinned copper, PVC insulated with crimped terminal connections.
- C. Enclosure shall be approximately 48" W x 48" H x 12" D. The top of the panel shall stand no higher than 72-inches from the top of the support concrete pad. In any case, it shall be sized to facilitate maintenance of enclosed equipment with a double door. Total length of the enclosure will depend on the size of the pumps but shall be sized to provide enough space so that every piece of equipment can be easily reached for service and maintenance. The outer doors shall be furnished with a locking latch and staple for padlock, to be furnished by the MD-WASD. All hardware shall be stainless steel. Provide every outer door with a limit switch to trip a remote alarm in case of unauthorized opening. Panel seams shall be continuously welded and ground smooth. All exterior joints shall be ground level and polished smooth. Stiffeners shall be added to panel sides and doors as necessary to ensure rigidity. Lifting eyes and a rolled lip around

three sides of the outside doors shall be provided. Provide also a rain shield over the generator outlet or access opening. Enclosure shall be 12-inches deep minimum.

- D. The double doors shall be made of the same material as the enclosure. All edges of the doors shall be folded inward, similar to the cabinet to form a rigid non-flexing door. The door shall be hung on a continuous stainless steel hinge with stainless steel bolts and nuts. The door shall be equipped with a three-point locking latch, a handle and a heavy-duty stainless steel staple for a padlock. Provide a friction type latch on hinge side to keep the door in position desired and to keep it from being closed by the wind.
- E. Cabinet anchorage shall consist of chemical adhesive anchor cartridge system 5/8" ϕ , minimum, stainless steel anchor threaded rod with 5-1/2", minimum, depth of embedment. The cabinet shall be secured to the concrete base at a minimum of four locations.
- F. An external red LED strobe light, vapor tight with aluminum lens protector shall be mounted on a side of the enclosure. The voltage of the strobe light shall be 120 Volts AC and will flash on an alarm condition. The strobe light will continue to flash after the alarm silence button is pressed until the alarm condition has cleared.
- G. The alarm bell shall be 120 volt A.C., 6 inches diameter, 90 db, weatherproof with protecting guard. Bell shall be Simplex Series 4090 or approved equal.
- H. A cast or stamped plate, with the legend "Miami-Dade Water and Sewer Department, Tel. (305) 274-9272" in characters a minimum of 2-inches high, shall be firmly attached to the upper portion of the door by welding or tamper-proof bolting.
- I. Provide stainless steel weather and sun shield welded to top of panel enclosure as shown on drawings if Variable Frequency Drives (VFD) or Soft-Start equipment are included and located within the enclosure. Shield shall be factory installed.
- J. All hardware including hinges, 3- point latches and handles shall be corrosion-resistant metal.
- K. Make all punching, reaming, cutting and other fabricating work before any finish is applied. Prior to painting, clean, degrease and phosphate-clean all panels. Final finishing, not less than three coats of semi-gloss polyurethane paint applied over a rust inhibitor primer. Panel interior to be white, with exterior surfaces of light gray ANSI-61.
- L. Provide print pocket inside the panels to hold detailed wiring and interconnecting diagrams. One copy of the relevant drawings shall be provided and placed in these pockets.
- M. Wiring to be stranded copper with 600 volt rated thermoplastic insulation. Power wiring shall be No. 14 AWG and control wiring No. 16 AWG minimum. Electronic signal wiring shall be No. 18 AWG twisted and shielded pairs.

Wiring shall not be spliced. Wiring shall be tagged for identification with printed wire sleeves or self-stick labels.

1. Color Coding to be as follows:
 - a. Black: AC hot (line feed and load circuits).
 - b. White: AC neutral.
 - c. Green: Bonding ground.
 - d. Red: AC control circuits.
 - e. Yellow: Wiring with foreign voltage.

- N. All wiring to and from field mounted devices shall be terminated at terminal strips, not directly connected to devices. Use plastic wireway Panduit or equal to route wire within the panel. Wireway shall be run in continuous length with snap-on covers, with AC and DC power wiring in separate wireways.
- O. Protect all devices against damage from electrical transients induced in interconnecting lines by lightning discharges and nearby electrical equipment. Surge suppressors shall be provided at least at any interconnection of AC power and electronic equipment and at every analog signal input with circuits extending outside the building.

2.08 PANEL MOUNTED AIR CONDITIONING UNIT (VFD APPLICATIONS ONLY)

- A. The enclosure shall be Stainless Steel NEMA 4X rating fully gasketed for tight, leakproof installation. It shall be UL/CUL listed with closed loop cooling to allow the interior airflow system to be isolated from the ambient airflow system. The system shall be designed so no ambient air can invade the cool, dehumidified sensitive compartment.
- B. Condenser Coils shall be Epoxy-Coated. This coating shall withstand 1000 hours of salt spray per the ASTM B 117 test method.
- C. An air cured coating shall be sprayed on interior copper lines and brazed joints on the condenser side to provide protection from corrosive environments. The coating shall withstand 1000 hours of salt spray per the ASTM B 117 test method.
- D. The unit shall include thermostatic Low Temperature Control to prevent over-cooling and to provide energy-efficient operation. Refrigerant shall be R410A.
- E. Filters shall consist of a multi-layer grid of sturdy corrugated aluminum, securely held in a one-piece aluminum frame. Filters are required wherever air is drawn into an electronics enclosure or related cooling equipment to keep internal parts as clean as possible.
- F. A short cycle relay shall be installed to protect the compressor from possible damage due to harmful short cycling, (frequent starting) where temperature controls enable the compressor to restart frequently or after a power interruption.
- G. The unit shall be as manufactured by Kooltronic or approved equal. The unit shall be sized appropriately.

PART 3. EXECUTION

3.01 EXAMINATION & INSTALLATION

- A. Verify items provided by other sections of Work are properly sized and located.
- B. Verify that built-in items are in proper location, and ready for roughing into Work.
- C. The Contractor shall provide limit switch to turn light "ON" when dry well hatch is opened.
- D. Minimum interrupting capacity of the electrical panel shall be 10,000 AMPS.
- E. Sump pump shall be provided with high level alarm wired to the telemetry.
- F. A sump pump, discharge piping and local switch shall be installed in the valve pit in.

END OF SECTION